# Database Analyzer User Manual

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| Author | Malloc Inc. |
| Contact | dba@mallocinc.com |
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# Database Analyzer
# version 5.3

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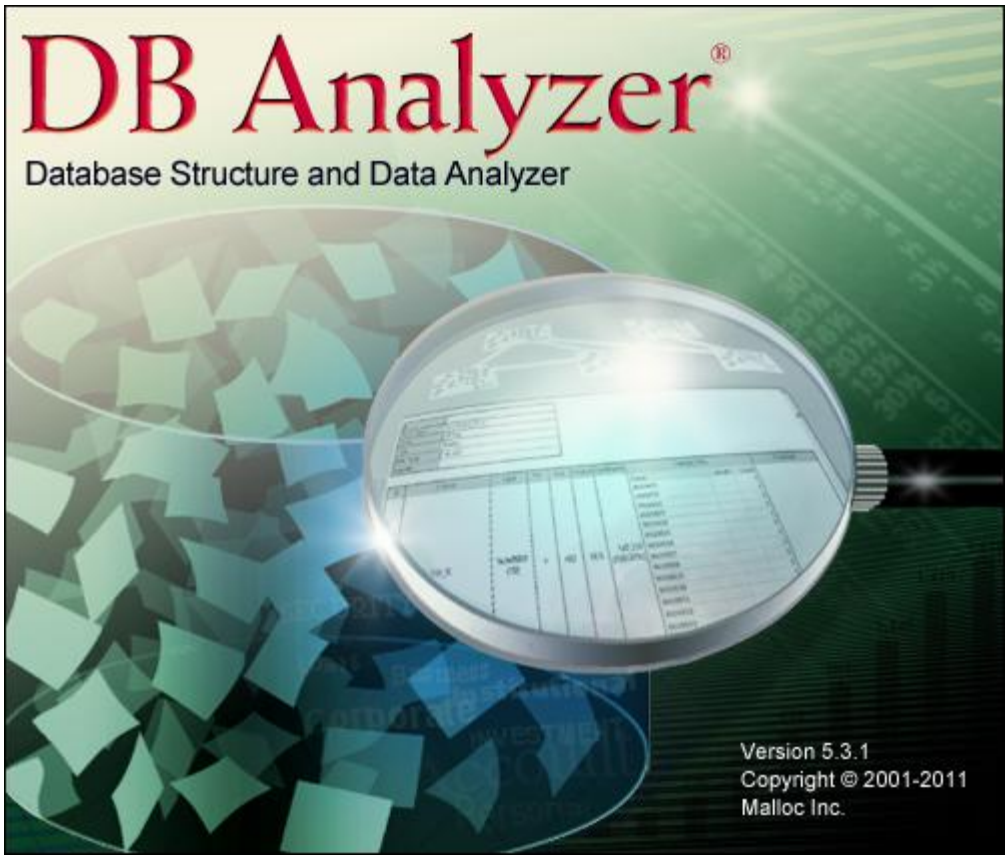



## Description

DB Analyzer is a tool that helps you analyze database server, database structure and data.

The following analysis can be performed:

- database server features
- database structure (catalogs, schemas, tables, views, columns, constraints)
- data (sample data, cardinality, occurrence, etc.)
- relationships between database tables

DB Analyzer is designed to help IT personnel such as business analysts, managers, architects, developers, administrators to better understand how and what data is stored in the database. It gives a huge jumpstart during the data conversion, data mapping, system development, optimization, troubleshooting and in any task where good understanding of the database and the data is required.

## Benefits

DB Analyzer analyzes database structure and **data**. This particular feature distinguishes this software from CASE tools such as Erwin and Power Designer where you can analyze structure of the database but not the data.

DB analyzer is not to meant to replace CASE software but to be used in addition or as stand alone software depending on the type of the user.

For example:

- Business analyst might be interested in what data is stored in certain tables and columns – what is really stored in field BOND_DESC?
- Developer might be interested in format of data – does the phone number have spaces, dashes, brackets?
- Database administrator is interested number of records in database tables so he can do the proper sizing of the database.
- Data architect is interested in data duplication so he can determine degree of model normalization, utilization of the space – why filed declared as CHAR(100) has only 'Y' and 'N' values, etc.
- QA analysts can check the quality of test bed database and ensure the data is sufficiently diversified and appropriate for user acceptance testing.
- System architect might be interested in available database features -

All this information can be obtained by typing SQL commands however that required skills and it is tedious and error prone. DB analyzer produces consolidated and convenient way to exploit this information at your fingertips.

## Compatibility

GUI User interface is running on Windows 2000/XP/Vista/Windows 7.

It can also run on X Windows and MAC OS however these distributions are not supported.

The following databases are supported

- Oracle
- DB2
- Sybase
- Microsoft SQL Server
- Microsoft Access
- Other databases that support JDBC interface - contact Malloc Inc for demo.

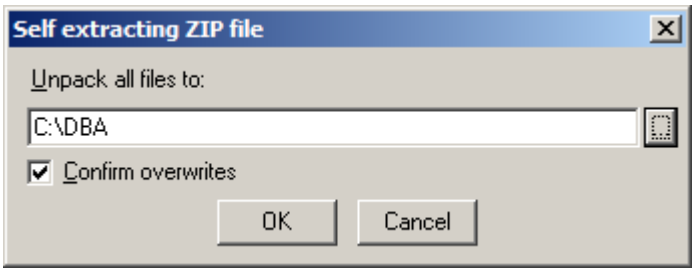
## Running Database Analyzer as a Batch Process

Database Analyzer can run from command line as a batch process (without GUI interface) on Windows and UNIX. This method is convenient for scheduling longer processes. Sample script demonstrates how you can run Database Analyzer in the background process. Process will continue running even if you logout from the system.

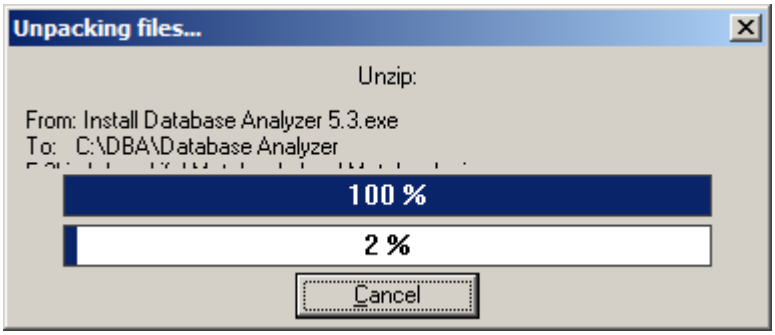
# Installation

Installation of the Database Analyzer is simple and does not require a special privileges on your computer. Also, no changes to the registry file are made so installing it will not affect performances of your computer. Un-installation is as simple as removing the directory where “Database Analyzer” is installed.

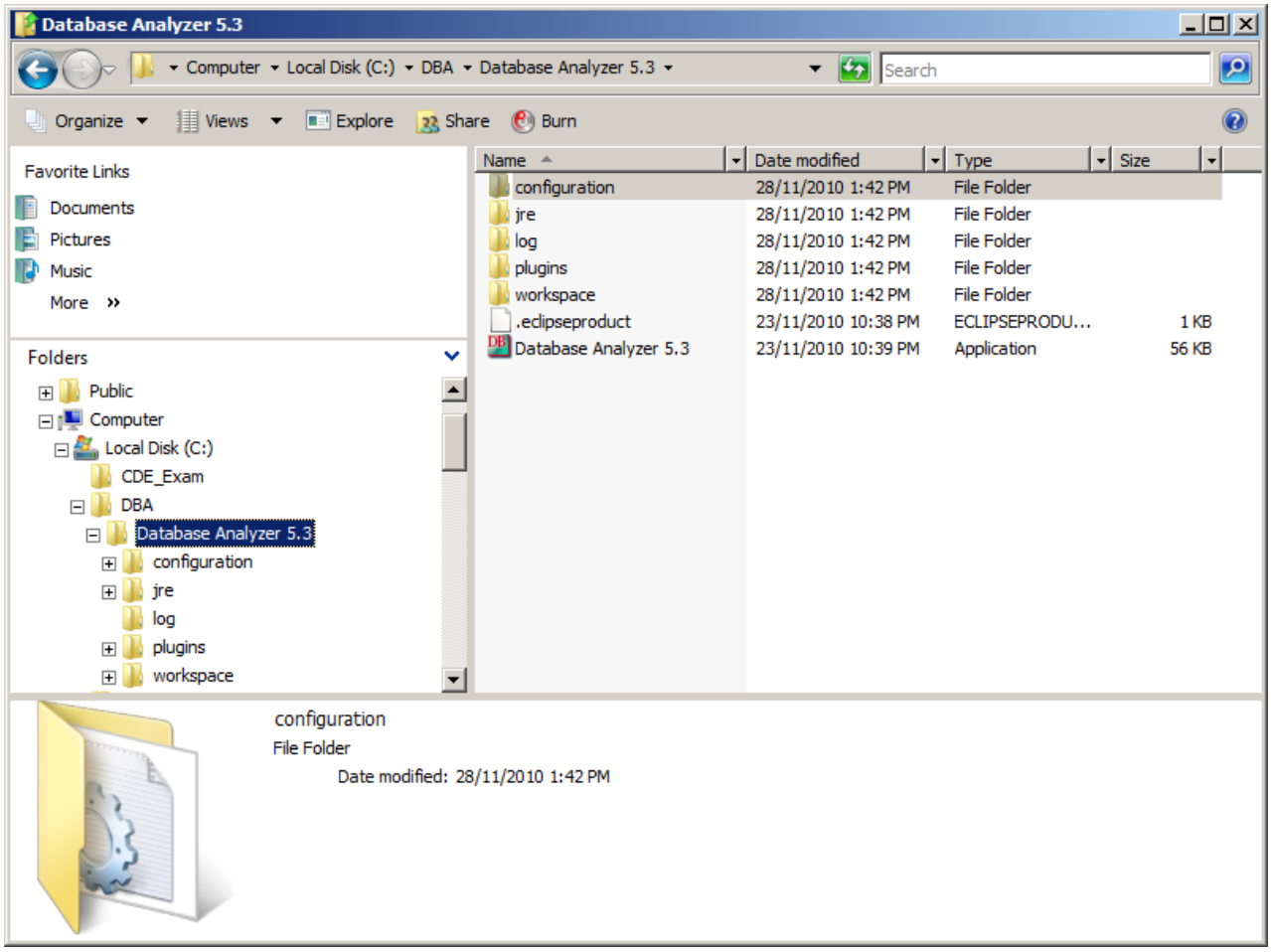
1. Create a directory where you would like to install Database Analyzer, for example “C:\DBA”
2. Download “Install Database Analyzer 5.3.exe” to some temporary location on your disk. This is installation program that can be deleted after installation is completed.
3. After download is complete execute “Install Database Analyzer 5.3.exe”
4. Program will ask you about the location where you want “Database Analyzer” to be installed. Choose directory you created in step #1 (C:\DBA) –see picture below.



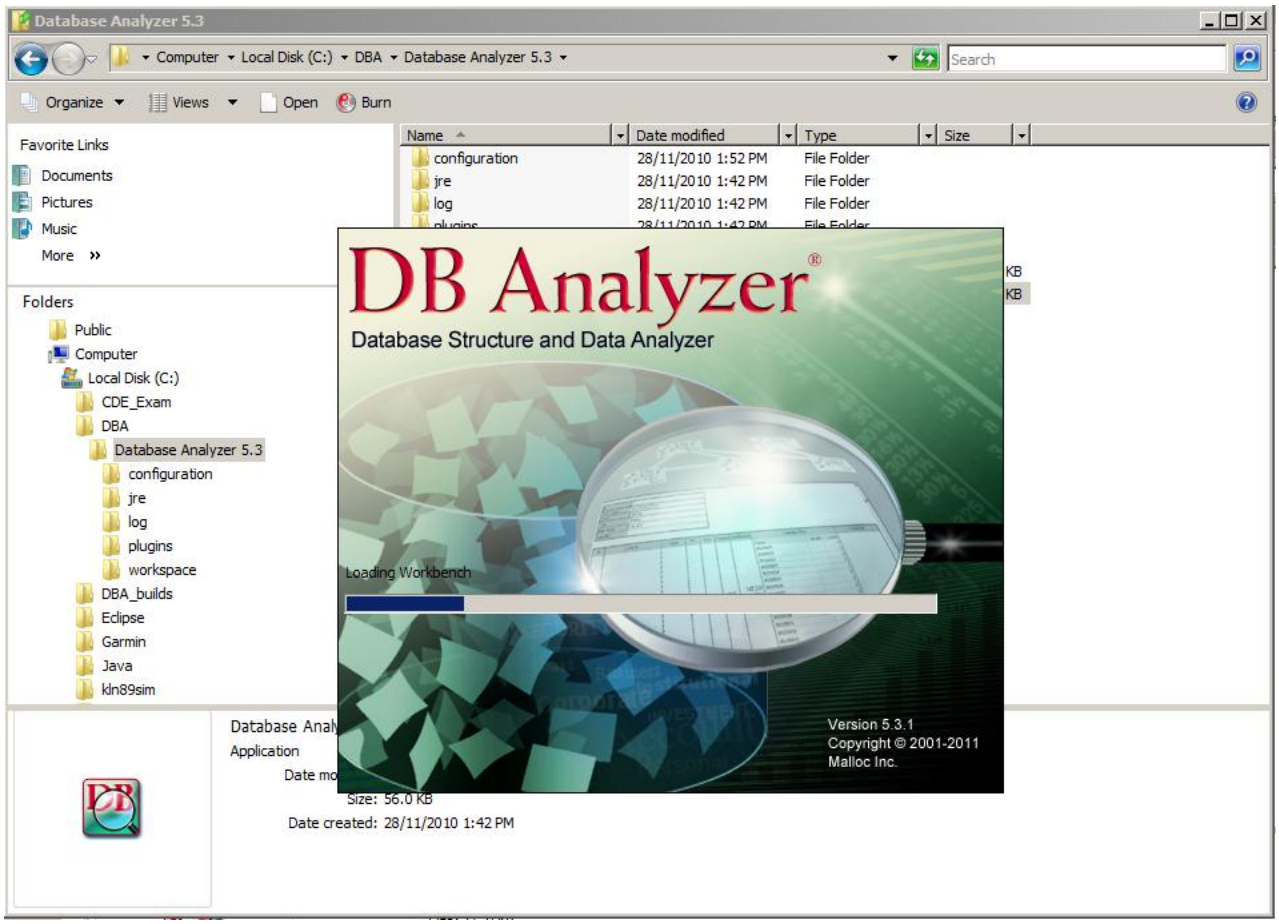

5. Installation process will look something like this:




6. When installation process finishes you can start application by running “C:\DBA\Database Analyzer 5.3\Database Analyzer 5.3.exe” (see screens below)




## Running Database Analyzer




Database Analyzer front end interface is divided into seven screens (tabs):

1. Configuration
2. Connection
3. Analysis
4. Target Objects
5. Output
6. Settings
7. Code Generator

## Configuration

When you start Database Analyzer the first screen (tab) to be displayed will be Configuration"

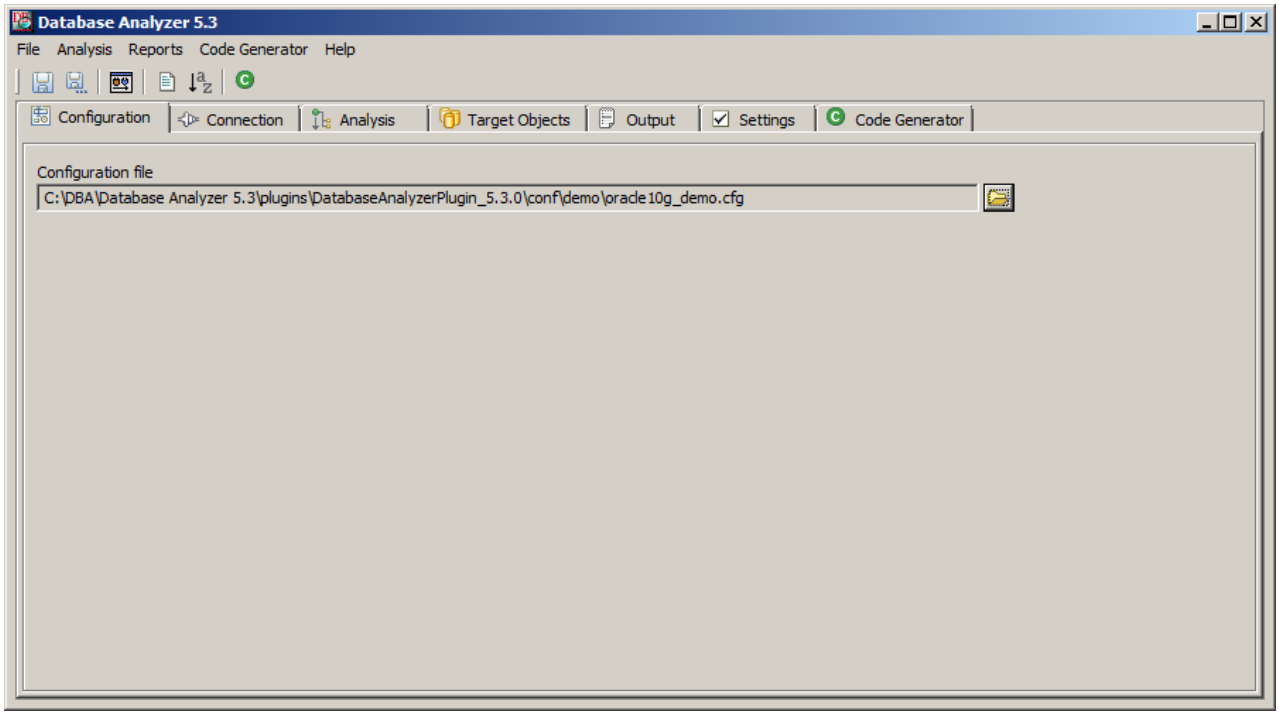
Configuration files have extension "cfg" and they keep all information about certain analysis such as :

- Database connection parameters
- What needs to be analyzed
- What kind of reports should be produced
- Code generator parameters
- Location of the analysis files

When you specify these parameters in Database Analyzer front end application you can save them for future use by clicking on the “File” and either “Save” or Save As”. There is no option “New” to create new configuration file. Instead you would open existing, probably similar configuration file, make changes and then use option “Save As” to create new configuration file.

Configuration files can be edited manually in the editor however it is better to do it in the Database Analyzer.

The easiest way to clone configuration file is to open exiting, similar file, make desired changes and then use “Save As” option under “File” menu to save it under different name.




## Connection to the database

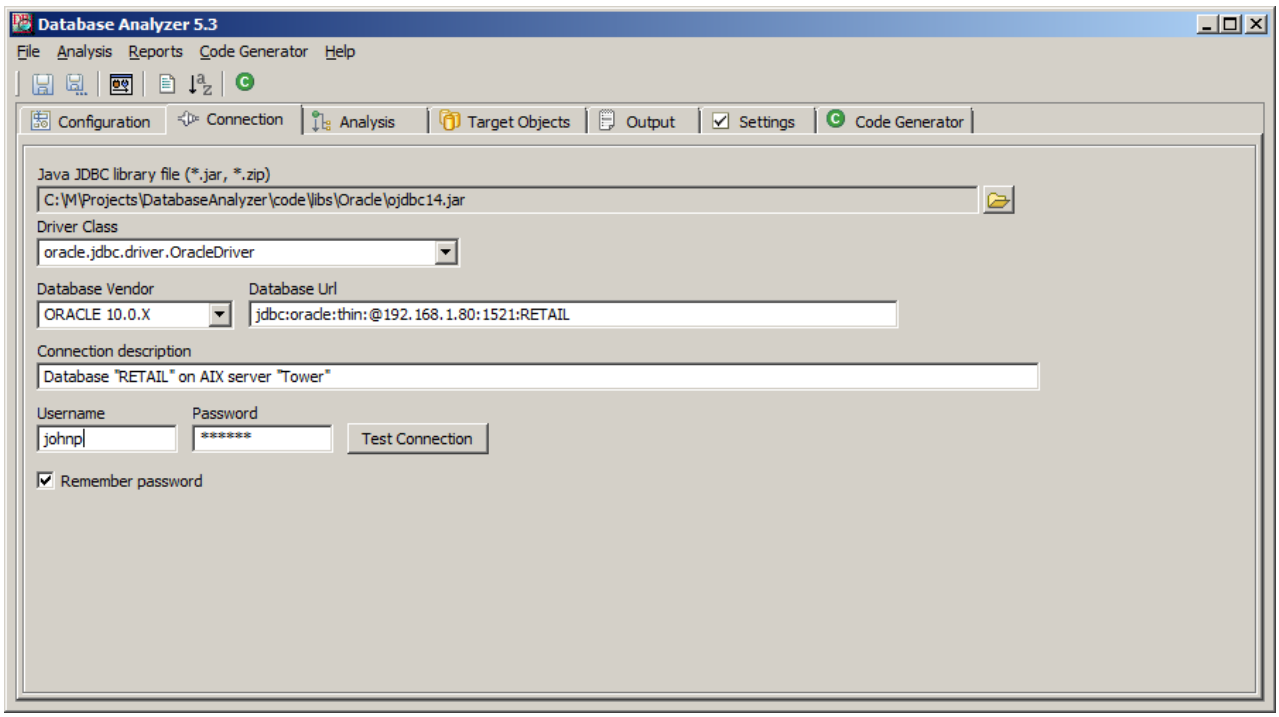
Database Analyzer use JDBC standard to connect to the database. Application includes drivers for:

1. Oracle
2. DB2
3. Sybase SQL
4. Microsoft SQL Server

These drivers are proprietary software of the database vendor. This software is always available for free download from the vendor' and in general, the newest version should be used.

Creating connection goes as follows:

1. Choose appropriate driver.
2. Once driver is chosen, Database Analyzer will examine the file and it will offer all possible "Driver Classes" that could be used. Choose the one you want to use.
3. Select Database Vendor
4. Type in "Database Url" according to JDBC standard (some samples for different database vendors are provided below).
5. Connection description is a free form text that will appear on the reports and it is used to distinguish particular database connections.
6. Enter username and password.
7. Use push button "Test Connection" to make sure that information entered is correct.




## Sample Connections

See this link!

http://e-docs.bea.com/wli/docs81/rdbmseg/intro.html

**Oracle**

http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/htdocs/jdbc_10201.html

**jdbc:oracle:thin:**@*server_name***:***port***:***service_name*

- *server_name* – name of the server machine where database server is running. This can be IP address of the server as well. If your environment is not configured properly the only way to connect to your database may be by using IP address instead of server name.
- *port – network port where database listener is active*
- *service_name – Oracle service name on the server identified by "server_name". It is usually the same as instance name.*

Examples:
jdbc:oracle:thin:@production:1521:oraprd
jdbc:oracle:thin:@134.66.25.121:1521:oraprd

**Sybase**

Setting character set example:
jdbc:sybase:Tds:server_prod:4500?CHARSET=iso_1

If database character set is roman8 or older version:
jdbc:sybase:Tds:todev108:4500?CHARSET=iso_1&CHARSET_CONVERTER_CLASS=com.sybase.jdbc2.utils.TruncationConverter

Refer to Sybase JDBC documentation for more information on JDBC parameters.

Example:
**jdbc:sybase:Tds:**server_prod**:**777

**MS Access**

Example:
**jdbc:odbc:DATA_SRC1**

"DATA_SRC1" is data source name configured in "ODBC" configuration

**MS SQL Server**

jdbc:microsoft:sqlserver://<*host_name*>:<*port_number*>;DatabaseName=<*database_name*>. However, if **Other Driver** was selected from **JDBC driver** pull-down list, then the **Connection URL** field is enabled allowing you to either type or select the appropriate URL connection.

**DB2**

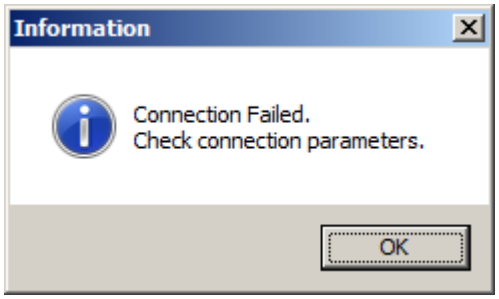
jdbc:db2://<*host_name*>:<*port_number*>/<*database_name*> (where <*database_name*> is the name of database name that you provided in step

## Downloading JDBC Drivers

| Database | Driver File |
|---|---|
| Oracle 10g Release 2 | ojdbc14.jar |
| | |
| | |
| | |
| | |
| | |

**Troubleshooting Database Connection Problems**

If you get the following message when you test your database connection then you should fix that problem before proceeding with database analysis:




Check all entices that you made in `Connection` screen. If you cannot see the problem that you have an option to look at the detailed Database Analyzer log file:

**c:\DBA\Database Analyzer 5.3\log\dbadministrator.log**

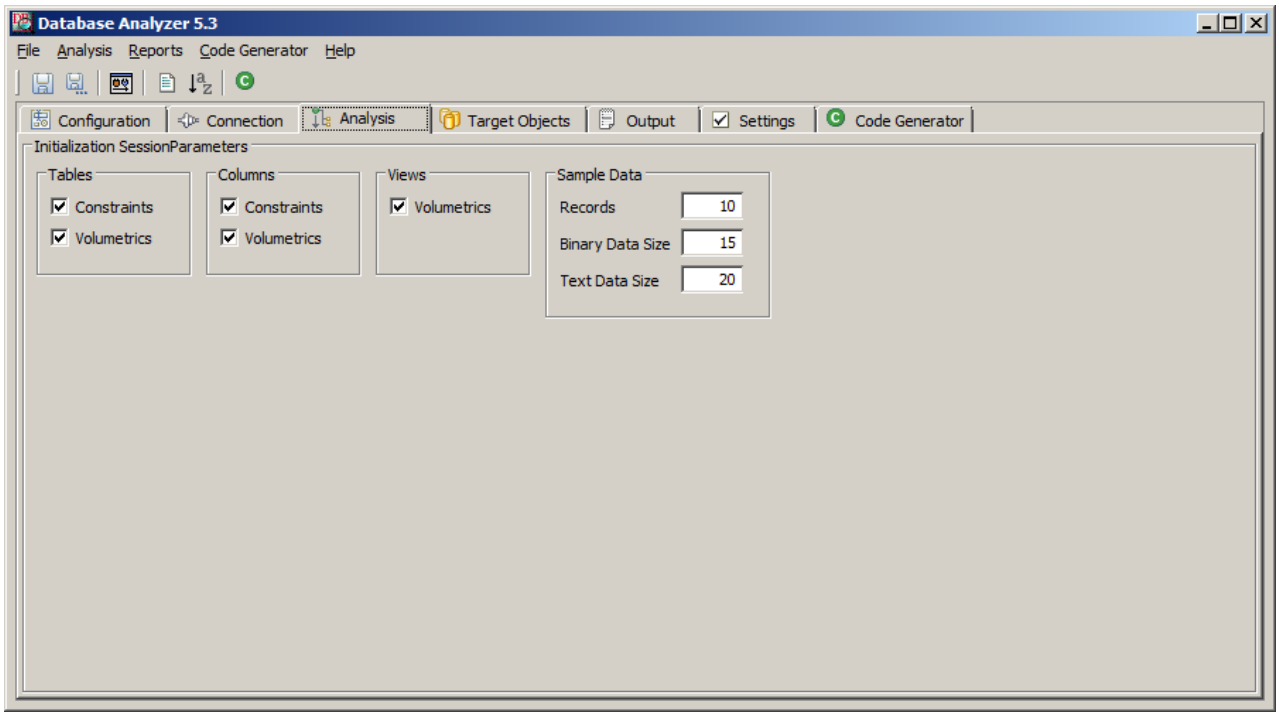
In this file you may find message that looks something like this:

```
2010-11-29 14:28:51,045 ERROR [main] DatabaseConnectionFactory -> SQLException:
Failed to connect to "Database "RETAIL" on AIX server "Tower""
2010-11-29 14:28:51,045 ERROR [main] DatabaseConnectionFactory -> Stack trace:
[Ljava.lang.StackTraceElement;@1db6942
2010-11-29 14:28:51,045 ERROR [main] DatabaseConnectionFactory -> Error
message:     Io exception: The Network Adapter could not establish the
connection
2010-11-29 14:28:51,045 ERROR [main] DatabaseConnectionFactory -> Error code:
17002
```

This particular error indicates data database is not available on this IP address and port and you should verify this information with your Database Administrator.

## Analysis Tab

In this section user can decide what database features will be analyzed.




**Volumetrics:**
Number of records in the table

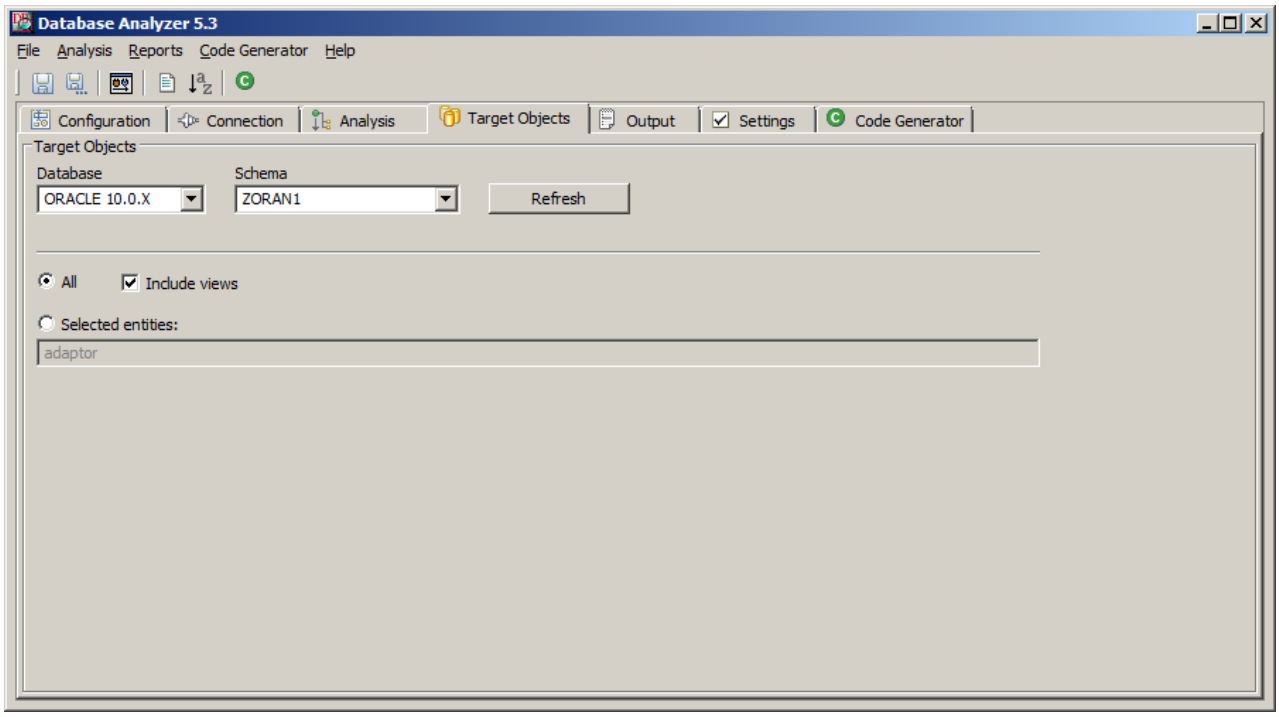
**Constraints:**

**Sample Data:**

- Records – amount of sample data to be retrieved from the database
- Binary Data Size –
- Text Data Size -

### Target Objects

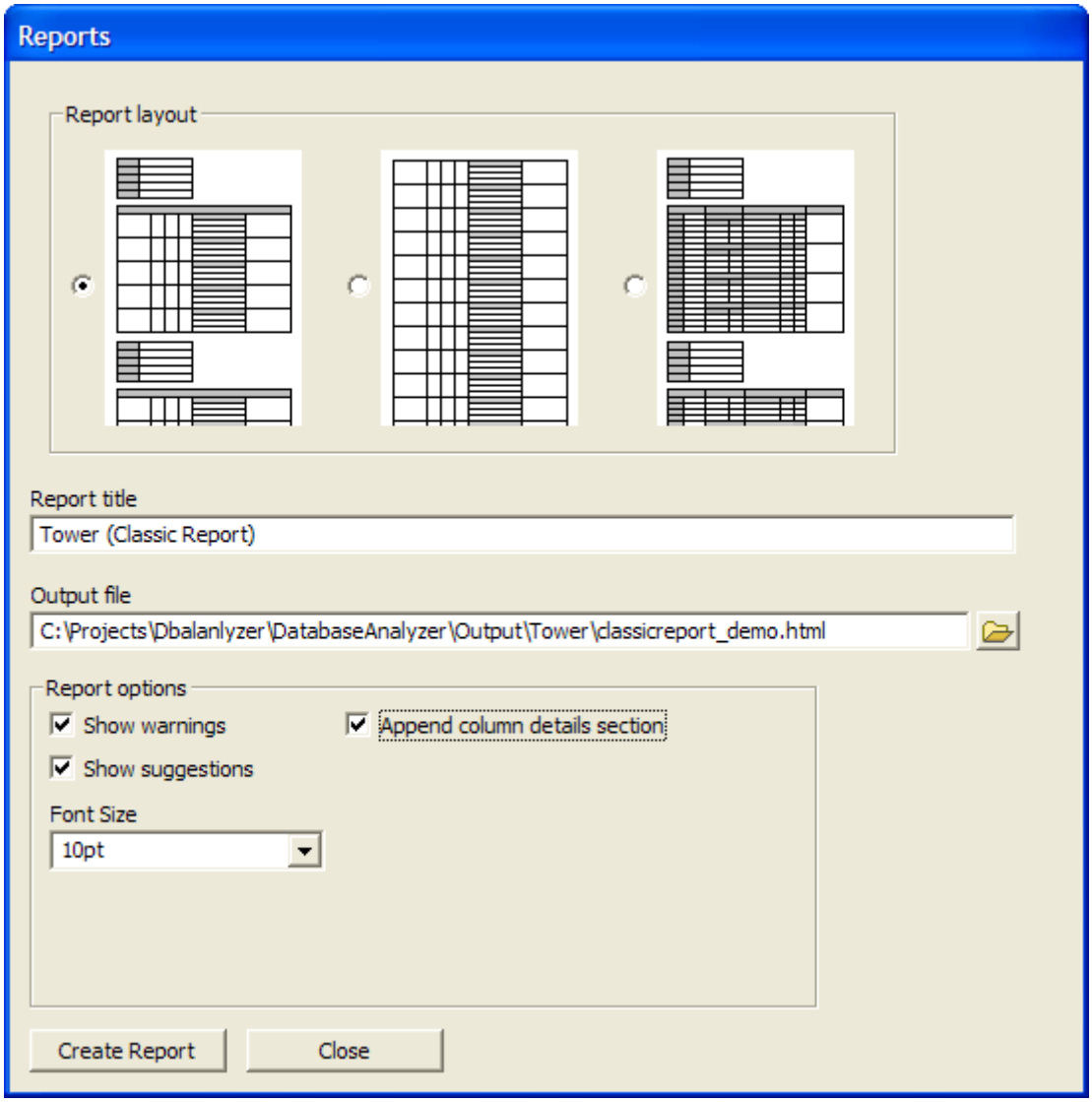
## Analyze database objects by name



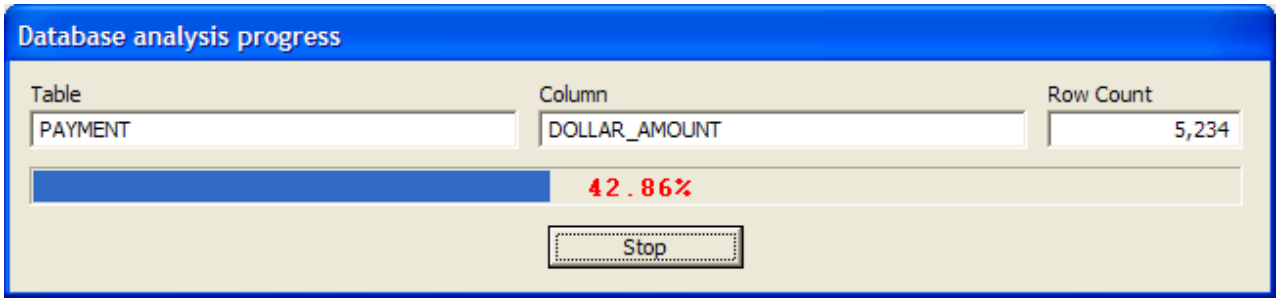

## Creating Reports

There are three report layouts:

1. Classic Report
2. Continuous Report
3. Relationship Report




Sample data is included in report and is ordered by occurrence in that particular field.


Database analysis progress
Table
PAYMENT
Column
DOLLAR_AMOUNT
Row Count
5,234
42.86%
Stop

## Analyze database objects by type

## Analyze specific database object's features

## Warnings

- There is no PK in table
- PK is not mandatory field
- Table is orphan

## Special features

- Database analysis starts from the point where it was stopped even if system crashes.
- Application can be terminated at any given moment either on purpose by clicking the process or because of the system failure. In any case database analysis will continue from the point of failure meaning that it will not need to recreate information that was made before the moment of failure. Also, binary files are usable even if database analysis is not continued. They can be used to produce reports as well as DAO code, however those would be produced only for tables analyzed before the point of the failure.

# Reports

All reports produced in HTML format and can be opened in all popular browsers. Reports are also editable – they can be imported in for example MS Word where file can be converted in different format, including Microsoft ".doc" format. Once HTML file is imported into Word, user can add footers, headers, page number, select paper orientation and basically use any MS Word feature to make document look like any other company document. Some examples are provided below.

**Special features:**

- reports can be opened in any browser, no need for specialized software to read reports
- reports are editable
- provide information about database structure and the data
- provide warnings and suggestions about possible improvements of the data model
- easy to produce
- available in three different formats with options to include or exclude sections of the report

Sample MS Word Documents.

**Classic** report provides information about database server, databases (Sybase and MS SQL Server support multiple databases under the same database server), schemas, tables and views, columns and data.

**Continuous** report provides the same information as Classic report however in format which is suitable for adding new columns in the document. This is particularly handy when user wants to put some additional information such as data transformation rules in case of a mapping document.

**Relationship** report provides information about referential integrity in the database. On that report user can see what Primary Key columns are referenced by what foreign key columns and vice versa. Some popular data modeling tools cannot give information about parent columns so this feature is a great addition to Case tools.

Common sections in all reports:

- Basic database server features
- Database server limitations
- Database server supporting features
- List of databases
- Detailed tables information
- List of schemas in database selected to be analyzed
- List of tables in databases and schema selected to be analyzed
- Detailed columns information section (at the end of the document)

# Report sections

### Basic database server features

| Feature | Value |
|---|---|
| Connection Description | DBAnalyzer 1 Database on Tower |
| Product Name | Oracle |
| Database product name: | Oracle |
| Catalog term: | |
| Schema term: | schema |
| Identifier Quote String: | Oracle |
| Search String Escape: | // |
| "Extra" characters that can be used in unquoted identifier names (those beyond a-z, A-Z, 0-9 and _): | $# |
| Database Major Version: | Information not available |
| Database Minor Version: | |
| Database Product Version: | Oracle Database 10g Enterprise Edition Release 10.1.0.2.0 - Production With the Partitioning, OLAP and Data Mining options |
| Driver Major Version: | 9 |
| Driver Name: | Oracle JDBC driver |
| Driver Version: | 9.2.0.1.0 |
| Numeric Functions: | ABS, ACOS, ASIN, ATAN, ATAN2, CEILING, COS, EXP, FLOOR, LOG, LOG10, MOD, PI, POWER, ROUND, SIGN, SIN, SQRT, TAN, TRUNCATE |
| String Functions | ASCII, CHAR, CONCAT, LCASE, LENGTH, LTRIM, REPLACE, RTRIM, SOUNDEX, SUBSTRING, UCASE |
| Database URL | jdbc:oracle:thin:@192.168.1.80:1521:zoracle |
| User name used for this connection | DBANALYZER_1 |
| Database is read only | No |
| Database is case sensitive | N |
| Data definition statement within a transaction forces the transaction to commit | Y |
| Database ignores a data definition statement within a transaction | N |
| String used to quote SQL identifiers | " |

### Database Server limitations

| Feature | Value (zero means that there is no limit or the limit is not known) |
|---|---|
| Max Row Size: | 2000 |
| Max Row Size includes BLOB(s) (includes the SQL data types LONGVARCHAR and LONGVARBINARY) | Y |
| Max Table Name Length: | 30 |
| Max User Name Length: | 30 |
| Max Tables In Select | 0 |
| Maximum length (in hex characters) for a binary literal | 1000 |
| Maximum number of characters allowed in a catalog name | 0 |
| Maximum number of characters allowed for a character literal | 2000 |
| Maximum number of characters this database allows for a column name | 30 |
| Maximum number of columns this database allows in a GROUP BY clause | 0 |
| Maximum number of columns this database allows in an index | 32 |
| Maximum number of columns this database allows in an ORDER BY clause | 0 |
| Maximum number of columns this database allows in a SELECT list | 0 |
| Maximum number of columns this database allows in a table | 1000 |
| Maximum number of concurrent connections to this database that are possible | 0 |
| Maximum number of characters that this database allows in a cursor name | 0 |
| Maximum number of characters that this database allows in a cursor name | 0 |
| Maximum number of characters that this database allows in a procedure name | 30 |
| Maximum number of characters that this database allows in a schema name | 30 |
| Maximum number of characters this database allows in an SQL statement | 65535 |
| Maximum number of active statements to this database that can be open at the same time | 0 |

List of schemas in database selected to be analyzed

| Schema DBANALYZER_1 | Table | Type | Rows | Columns |
|---|---|---|---|---|
| 1. | ADDRESS | TABLE | 300 | 10 |
| 2. | CURRENCY_CODE | TABLE | 43 | 3 |
| 3. | ITEM | TABLE | 2,041 | 7 |
| 4. | LOGIN_HISTORY | TABLE | 1,987 | 4 |
| 5. | ORGANIZATION | TABLE | 42 | 5 |
| 6. | PAYMENT | TABLE | 5,187 | 4 |
| 7. | PAYMENT_INSTRUMENTS | TABLE | 31 | 3 |
| 8. | PERMISSION | TABLE | 8 | 5 |
| 9. | PERSON | TABLE | 108 | 8 |
| 10. | ROLE | TABLE | 10 | 4 |
| 11. | ROLE_PERMISSION | TABLE | 80 | 5 |
| 12. | TRANSACTION | TABLE | 4,318 | 4 |
| 13. | TRANSACTION_ITEM | TABLE | 989 | 3 |
| 14. | USERS | TABLE | 191 | 5 |
| 15. | USER_PROFILE | TABLE | 19 | 3 |
| 16. | USER_ROLE | TABLE | 10 | 3 |

Database server supporting features

| Feature | Supported |
|---|---|
| Mixed Case Identifiers | N |
| Mixed Case Quoted Identifiers | Y |
| Alter Table With Add Column | Y |
| Alter Table With Drop Column | N |
| Column Aliasing | Y |
| Convert | N |
| Table Correlation Names | Y |
| Different Table Correlation Names | Y |
| Expressions in Order By | Y |
| Order By Unrelated | Y |
| Group by | Y |
| Group by Unrelated | Y |
| Group by Beyond Select | Y |
| Like Escape Clause | Y |
| Multiple Result Sets | N |
| Multiple Transactions | Y |
| Non Nullable Columns | Y |
| Minimum SQL Grammar | Y |
| Core SQL Grammar | Y |
| Extended SQL Grammar | Y |
| ANSI 92 Entry Level SQL | Y |
| ANSI 92 Intermediate SQL | N |

| # | Column | Type | PK | Null | Unique | Cardinality | Sample Data | Comment |
|---|---|---|---|---|---|---|---|---|
| 1. | CURRENCY_CODE | CHAR[3] | 1 | NO | YES | 43 (100.00%) | Value / Length / Count<br>ADF 3 1<br>ADP 3 1<br>AED 3 1<br>AFA 3 1<br>ALL 3 1<br>ANG 3 1<br>AON 3 1<br>ARA 3 1<br>ARS 3 1<br>ATS 3 1 | |
| 2. | DESCRIPTION | VARCHAR2 [50] | | NO | YES | 43 (100.00%) | Value / Length / Count<br>ADF 3 1<br>ADP 3 1<br>AED 3 1<br>AFA 3 1<br>ALL 3 1<br>ANG 3 1<br>AON 3 1<br>ARA 3 1<br>ARS 3 1<br>ATS 3 1 | |

**Data duplication**

CURRENCY_CODE and DESCRPTIONS have same values and it is very likely that one of these columns is redundant.

| # | Column | Type | PK | Null | Unique | Cardinality | Sample Data | Comment |
|---|---|---|---|---|---|---|---|---|
| 8. | STATE | VARCHAR2 [50] | | YES | NO | 53 (17.67%) | Value / Length / Count<br>ON 2 206<br>TN 2 4<br>TX 2 4<br>FM 2 3<br>ID 2 3<br>MI 2 3<br>MN 2 3<br>NM 2 3<br>NV 2 3<br>OR 2 3 | |
| 9. | COUNTRY | VARCHAR2 [40] | | NO | NO | 2 (0.67%) | Value / Length / Count<br>Canada 6 206<br>United States 13 94 | |
| 10. | CURRENT_ADDRESS_IND | CHAR[1] | | NO | NO | 2 (0.67%) | Value / Length / Count<br>N 1 150<br>Y 1 150 | |

**Data Dispersion**

Verify if data dispersion is as expected. For example, “ON” appears fifty times more than any other STATE. “Canada” and “US” are the only countries in the COUNTRY field and first one much more frequent. CURRENT_ADDRESS_IND has exactly 50% of “Y” and “N” – how likely is to have that split?

| | |
|---|---|
| # | 11 |
| Table Name | ROLE_PERMISSION |
| Owner | DBANALYZER_1 |
| Type | TABLE |
| Row Count | 0 |
| Remarks | WARNING: Table does not have Primary Key.<br>WARNING: Table is empty. |

| # | Column | Type | PK | Null | Unique | Cardinality | Sample Data | Comment |
|---|---|---|---|---|---|---|---|---|
| 1. | ROLE_ID | NUMBER [22] | | NO | N/A | 0 | N/A | |
| 2. | SYSTEM_ID | NUMBER [22] | | NO | N/A | 0 | N/A | |
| 3. | MODULE_ID | NUMBER [22] | | NO | N/A | 0 | N/A | |
| 4. | WINDOW_ID | NUMBER [22] | | NO | N/A | 0 | N/A | |
| 5. | FUNCTION_ID | NUMBER [22] | | NO | N/A | 0 | N/A | |
| 6. | PERMISSION_TYPE | VARCHAR2 [10] | | NO | N/A | 0 | N/A | |

**Modeling Issues - Primary Keys**

Warnings in RED color are shown in case that table probably requires immediate attention. In this case table is missing a Primary Key and it is very likely that model needs to be verified and corrected.

Also, table does not have any records and maybe business logic has to be verified to confirm if this table is in fact required.

| | |
|---|---|
| Column Name | USER_ID |
| Table Name | LOGIN_HISTORY ( 1993 records ) |
| Allow NULL | NO |
| Ordinal Position | 2 |
| Data Type | NUMBER[22] |
| Primary Key Sequence | |
| Unique | NO |
| NULL count | 0 |
| Cardinality | 191<br>(9.58%) |
| Distinct values count | 191 |
| Sample Data | Value / Length / Count<br>517157 — 18<br>156825 — 17<br>601580 — 17<br>626540 — 17<br>955931 — 17<br>113597 — 16<br>208770 — 16<br>801001 — 16<br>251950 — 15<br>360806 — 15 |
| Max String Length | N/A |
| Max String Sample | N/A |
| Sample String Data | N/A |
| Constraint Information | Constraint name: USER HAS LOGIN HISTORY<br>Referenced column: USER_ID<br>Update rule: Update of the primary key updates child record(s)<br>Delete rule: Cannot delete primary key before child record(s) is deleted<br>Deferrability: Not Deferrable |
| Remarks | |

**Detailed column information**

This is optional section in the report. It provides detailed information about database table columns.

Particularly useful is “Constraint Information” about the referenced column and rules associated to the behavior enforced by the constraint (update and delete rule and well as deferability). Many ERD tools will not be able to provide this information.

Note that the table name is an active link which you can use to quickly go back to the table detail section.

| # | Column | Type | PK | Null | Unique | Cardinality | Sample Data | Comment |
|---|---|---|---|---|---|---|---|---|
| 1. | TRANSACTION_ID | NUMBER [22] | 1 | NO | YES | 962 (100.00%) | Value / Length / Count<br>101334 — 1<br>101766 — 1<br>102639 — 1<br>103039 — 1<br>103891 — 1<br>104054 — 1<br>105429 — 1<br>106222 — 1<br>106749 — 1<br>107524 — 1 | |
| 2. | ITEM_ID | NUMBER [22] | 2 | NO | YES | 962 (100.00%) | Value / Length / Count<br>100000 — 1<br>100956 — 1<br>101731 — 1<br>102947 — 1<br>104408 — 1<br>105031 — 1<br>106016 — 1<br>107651 — 1<br>109902 — 1<br>110249 — 1 | |

**Data Anomalies**

For this associative table data sample reveals possible data anomaly - all items are associated only to one transaction.

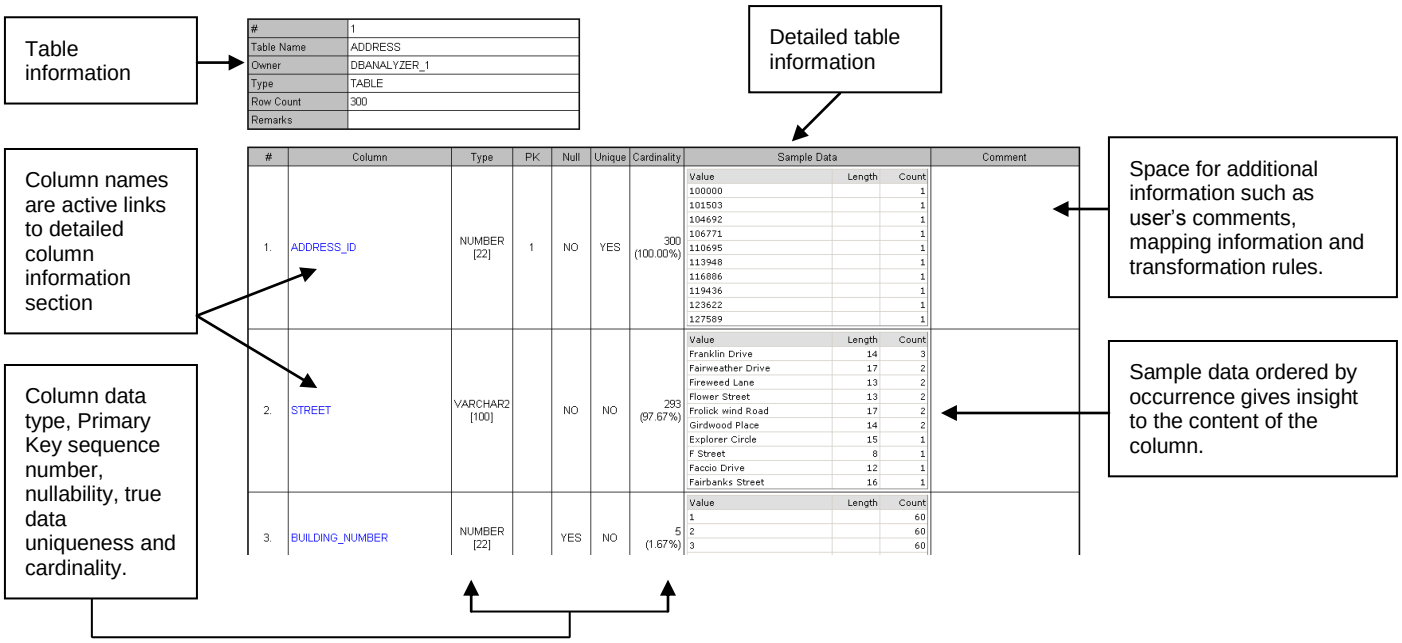
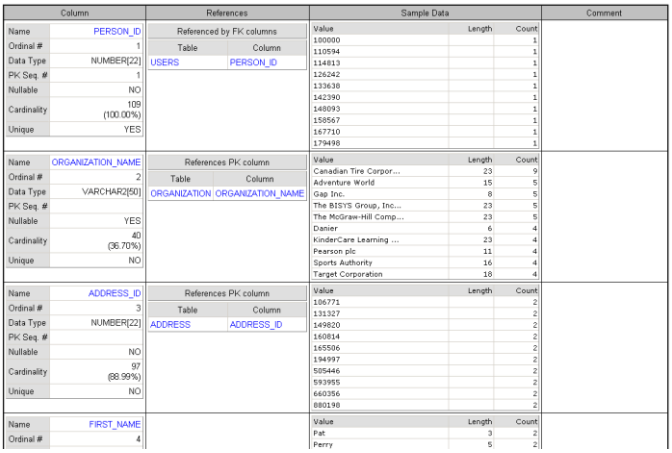


Table information
Detailed table information
Column names are active links to detailed column information section
Space for additional information such as user's comments, mapping information and transformation rules.
Column data type, Primary Key sequence number, nullability, true data uniqueness and cardinality.
Sample data ordered by occurrence gives insight to the content of the column.
# 1
Table Name ADDRESS
Owner DBANALYZER_1
Type TABLE
Row Count 300
Remarks
# Column Type PK Null Unique Cardinality Sample Data Comment
1. ADDRESS_ID NUMBER [22] 1 NO YES 300 (100.00%)
2. STREET VARCHAR2 [100] NO NO 293 (97.67%)
3. BUILDING_NUMBER NUMBER [22] YES NO 5 (1.67%)



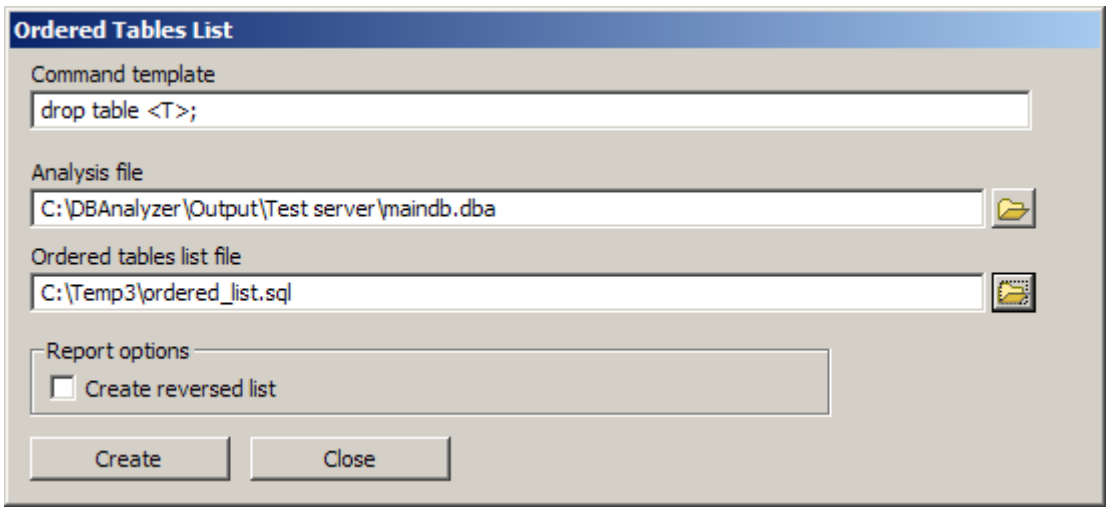

**Referential Integrity**

This report gives you information about relationships defined between database tables. You can see what columns are referencing table's Primary Key and what Primary Keys are referenced by table's Foreign Keys.

Note that all table and column name fields are active links.

## Creating ordered tables lists

This feature is used to produce ordered table list depending on relationship between tables. For example if you want to drop table by table you would use this method to create list of tables ordered in the way tables can be dropped, meaning that tables with no children will be dropped first.



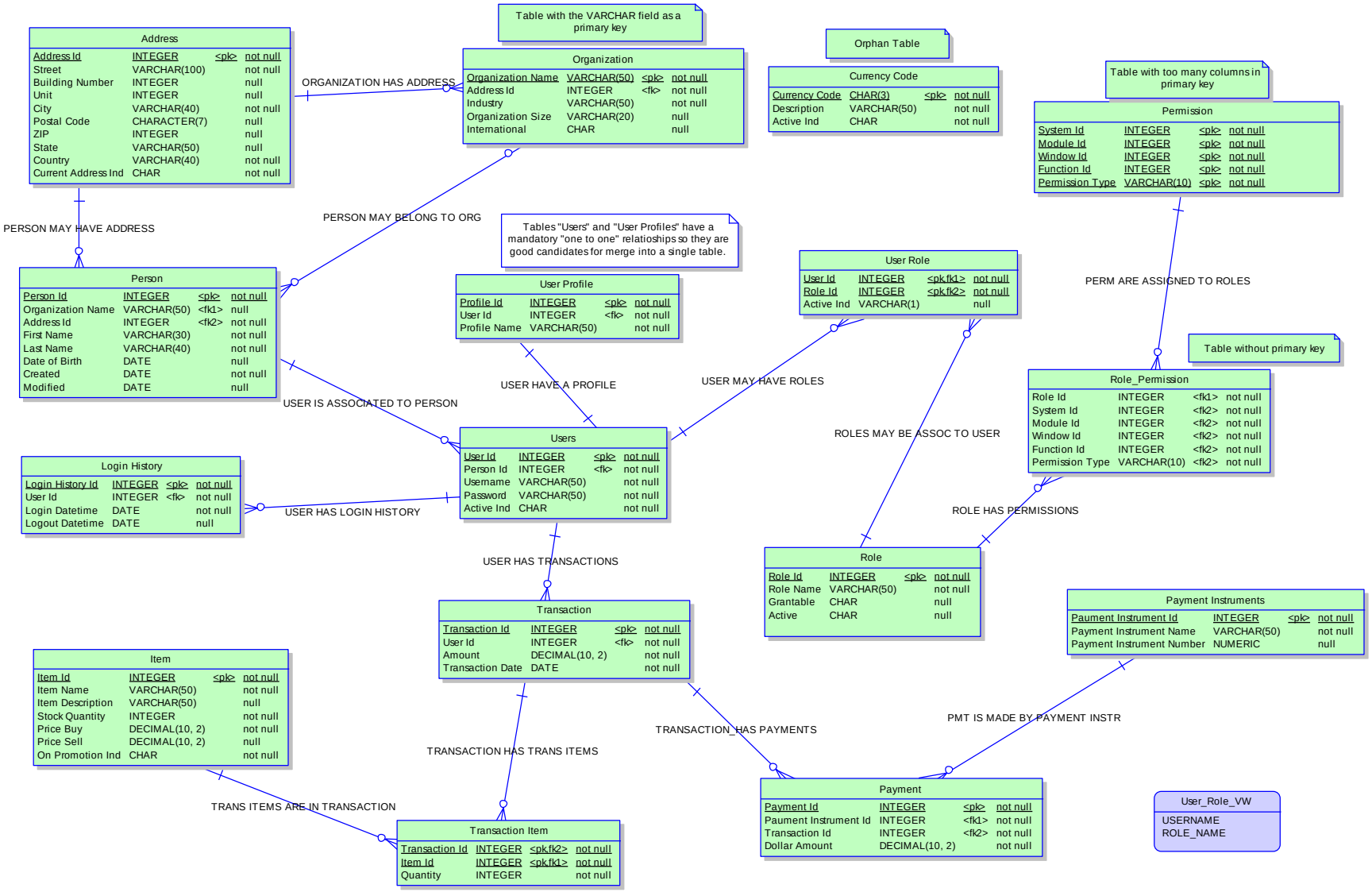

This method creates another list with the reverse order from the list created by method "getOrderedTableList". For example, this option can be used to create tables.

File “C:\Temp3\ordered_list.sql” will be created with the following content (see data model on next page):

```
drop table TRANSACTION_ITEM;
drop table USER_PROFILE;
drop table CURRENCY_CODE;
drop table ROLE_PERMISSION;
drop table PERMISSION;
drop table USER_ROLE;
drop table ROLE;
drop table PAYMENT;
drop table PAYMENT_INSTRUMENTS;
drop table LOGIN_HISTORY;
drop table TRANSACTION;
drop table USERS;
drop table PERSON;
drop table ORGANIZATION;
drop table ADDRESS;
drop table ITEM;
```

Note that database views are ignored when orderd tables list is created.

# Appendix A – Test Data Model


Address
Address Id INTEGER <pk> not null
Street VARCHAR(100) not null
Building Number INTEGER null
Unit INTEGER null
City VARCHAR(40) not null
Postal Code CHARACTER(7) null
ZIP INTEGER null
State VARCHAR(50) null
Country VARCHAR(40) not null
Current Address Ind CHAR not null
Table with the VARCHAR field as a primary key
Organization
Organization Name VARCHAR(50) <pk> not null
Address Id INTEGER <fk> not null
Industry VARCHAR(50) not null
Organization Size VARCHAR(20) null
International CHAR null
ORGANIZATION HAS ADDRESS
Orphan Table
Currency Code
Currency Code CHAR(3) <pk> not null
Description VARCHAR(50) not null
Active Ind CHAR not null
Table with too many columns in primary key
Permission
System Id INTEGER <pk> not null
Module Id INTEGER <pk> not null
Window Id INTEGER <pk> not null
Function Id INTEGER <pk> not null
Permission Type VARCHAR(10) <pk> not null
PERSON MAY HAVE ADDRESS
PERSON MAY BELONG TO ORG
Tables "Users" and "User Profiles" have a mandatory "one to one" relationships so they are good candidates for merge into a single table.
Person
Person Id INTEGER <pk> not null
Organization Name VARCHAR(50) <fk1> null
Address Id INTEGER <fk2> not null
First Name VARCHAR(30) not null
Last Name VARCHAR(40) not null
Date of Birth DATE null
Created DATE not null
Modified DATE null
User Profile
Profile Id INTEGER <pk> not null
User Id INTEGER <fk> not null
Profile Name VARCHAR(50) not null
User Role
User Id INTEGER <pk,fk1> not null
Role Id INTEGER <pk,fk2> not null
Active Ind VARCHAR(1) null
PERM ARE ASSIGNED TO ROLES
Table without primary key
Role_Permission
Role Id INTEGER <fk1> not null
System Id INTEGER <fk2> not null
Module Id INTEGER <fk2> not null
Window Id INTEGER <fk2> not null
Function Id INTEGER <fk2> not null
Permission Type VARCHAR(10) <fk2> not null
USER IS ASSOCIATED TO PERSON
USER HAVE A PROFILE
USER MAY HAVE ROLES
ROLES MAY BE ASSOC TO USER
Users
User Id INTEGER <pk> not null
Person Id INTEGER <fk> not null
Username VARCHAR(50) not null
Password VARCHAR(50) not null
Active Ind CHAR not null
Login History
Login History Id INTEGER <pk> not null
User Id INTEGER <fk> not null
Login Datetime DATE not null
Logout Datetime DATE null
USER HAS LOGIN HISTORY
ROLE HAS PERMISSIONS
Role
Role Id INTEGER <pk> not null
Role Name VARCHAR(50) not null
Grantable CHAR null
Active CHAR null
USER HAS TRANSACTIONS
Payment Instruments
Paument Instrument Id INTEGER <pk> not null
Payment Instrument Name VARCHAR(50) not null
Payment Instrument Number NUMERIC null
Transaction
Transaction Id INTEGER <pk> not null
User Id INTEGER <fk> not null
Amount DECIMAL(10, 2) not null
Transaction Date DATE not null
Item
Item Id INTEGER <pk> not null
Item Name VARCHAR(50) not null
Item Description VARCHAR(50) null
Stock Quantity INTEGER not null
Price Buy DECIMAL(10, 2) not null
Price Sell DECIMAL(10, 2) null
On Promotion Ind CHAR not null
TRANSACTION HAS TRANS ITEMS
TRANSACTION HAS PAYMENTS
PMT IS MADE BY PAYMENT INSTR
TRANS ITEMS ARE IN TRANSACTION
Payment
Payment Id INTEGER <pk> not null
Paument Instrument Id INTEGER <fk1> not null
Transaction Id INTEGER <fk2> not null
Dollar Amount DECIMAL(10, 2) not null
Transaction Item
Transaction Id INTEGER <pk,fk2> not null
Item Id INTEGER <pk,fk1> not null
Quantity INTEGER not null
User_Role_VW
USERNAME
ROLE_NAME